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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/796,603 | 03/08/2004 | Alex Salnik | TWI-24910 | 1794 |
| 28584 | 7590 | 06/01/2006 | EXAMINER | |
| STALLMAN & POLLOCK LLP 353 SACRAMENTO STREET SUITE 2200 SAN FRANCISCO, CA 94111 | | | LYONS, MICHAEL A | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2877 | |

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/796,603

Applicant(s)

SALNIK ET AL.

Examiner

Michael A. Lyons

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-6, 8, 10-12, and 14-20 is/are rejected.
- 7) ☒ Claim(s) 2, 7, 9, 13 and 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>030804</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

Figures 2 and 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 7 is objected to because of the following informalities: the word slope is misspelled "slop" in line 2 of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 18-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 18 recites the limitation "the resulting curve" in line 7 of the claim. There is insufficient antecedent basis for this limitation in the claim. What is this resulting curve the result of? Is it the result of one of the measurements, or multiple measurements?

Claim 18 recites the limitation "the delay curve" in 9. There is insufficient antecedent basis for this limitation in the claim. What is the delay curve? Is it the same curve as the resulting curve, or a different curve?

Claim 19 recites the limitation "the change in the function" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim. What change is being disclosed here?

Claim 19 recites the limitation "the exponential curve" throughout the claim. There is insufficient antecedent basis for this limitation in the claim. What is the exponential curve? Is it the resulting curve or the delay curve of claim 18, or is it a different curve?

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

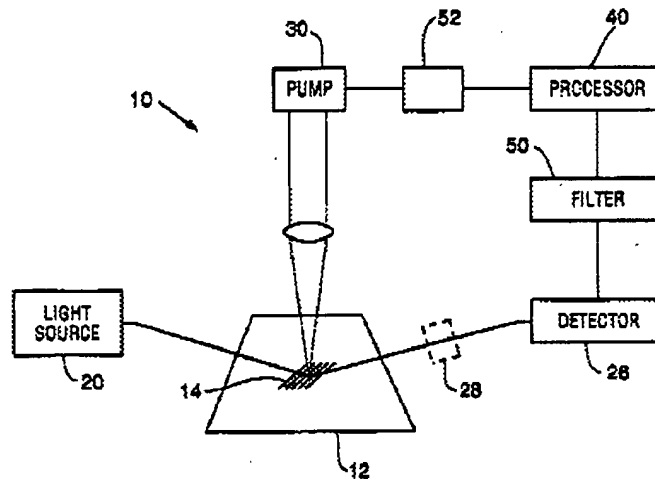
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 8, 10-12, 14-17, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Smith (6,888,632).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the

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inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.



Regarding claims 8 and 12, Smith (Fig. 1) discloses a method of evaluating the abruptness of a junction in a semiconductor sample, the method comprising focusing an intensity modulated pump beam 32 with lens 34 and a probe beam 22 on the surface 14 of sample 12, obtaining two or more measurements by analyzing the reflected probe beam using detector 26, which then sends a signal to processor 40 containing an in-phase value and a quadrature value, where the pump beam is intensity modulated at a predetermined frequency that is selected depending upon the desired measurement (Col. 6, lines 4-8), with the in phase and quadrature values being used to calculate the magnitude and phase of the signal (Col. 6, lines 28-44), which in turn can be used to derive an abruptness value for the junction (Col. 4, line 25).

As for claims 10 and 14, Smith discloses that, "a lens 32 can be used to focus the pump beam onto the sample. As noted above, it would be possible to tightly focus the pump beam to a spot size much smaller than the probe beam spot size. In this manner, the spatial resolution of the measurement can be improved." (Col. 5, line 66 – Col. 6, line 3). As such, tightening the

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spot size of the pump beam alters the power density by making it greater (conversely, making the spot size larger will decrease the power density as shown in the 6,658,037 patent to Kahen et al).

Regarding claim 16, Smith (Fig. 1) discloses a method of evaluating the depth of a junction in a semiconductor sample, the method comprising directing an intensity modulated pump beam 32 and a probe beam 22 on the surface 14 of sample 12, obtaining one or more measurements by analyzing the reflected probe beam using detector 26, filtering with filter 50 and processing with processor 40 the measurements to obtain quadrature components of the signal, the quadrature components being used to calculate the magnitude and the phase of the signal (Col. 6, lines 28-44), which in turn can be used to evaluate features of the sample (Col. 7, lines 10-28), such as ion implantation depth (junction depth) (Col. 4, lines 8-17).

As for claim 17, Smith discloses that “it is also well known to create libraries of signatures associated with various possible geometries. A measured signaled [sic] can then be compared to the library to determine the geometry of the sample” (Col. 7, lines 29-32).

Regarding claim 20, Smith (Fig. 1) discloses a method of evaluating two or more properties of a junction formed in a semiconductor sample, the method comprising directing an intensity modulated pump beam 32 and a nonmodulated probe beam 22 on the surface 14 of a sample 12, analyzing the in-phase and quadrature components of the reflected beam intensity in processor 40, the in-phase and quadrature components being used to calculate the magnitude and the phase of the signal (Col. 6, lines 28-44), which in turn can be used to evaluate features of the sample (Col. 7, lines 10-28), such as “ion-implantation dose or ion implantation depth (junction depth) or ion implantation lateral profile” (Col. 4, lines 8-17).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 11 and 15 are rejected under 35 U.S.C. 103(a) as being obvious over Smith (6,888,632) in view of Kahen et al (6,870,868).

The applied reference (Smith) has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the

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application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

As for claims 11 and 15, Smith discloses the claimed invention as discussed above regarding claim 8, but fails to disclose the use of a filter to change the power density of the pump beam.

Kahen, however, discloses in the background of the invention that the power density of a pump beam can be controlled with the use of optical filter wheels (Col. 3, lines 1-21).

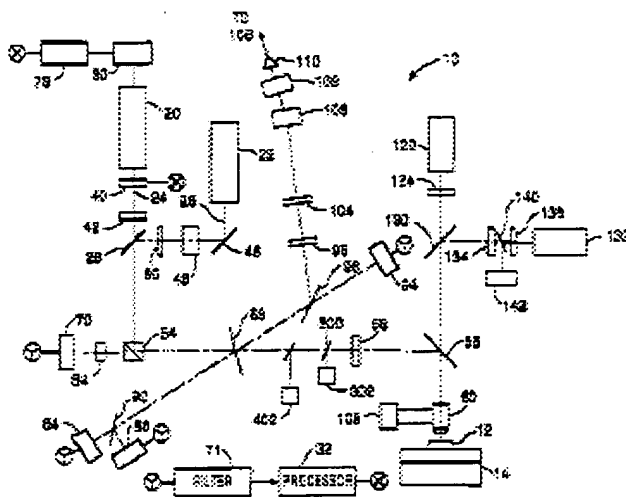
Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add a filter to the pump beam of Smith as per Kahen, the motivation being that the filter provides more direct control over the intensity of the light beam beyond the intensity control provided by signals sent from the synthesizer 52.

Claims 1 and 3-6 are rejected under 35 U.S.C. 103(a) as being obvious over Smith (6,888,632) in view of Opsal et al (5,978,074).

The Smith reference has a common assignee with the instant application, with the Opsal reference sharing a common assignee and one common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a

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showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).



Regarding claim 1, Smith (Fig. 1) discloses a method of evaluating the abruptness of a junction in a semiconductor sample, the method comprising focusing an intensity modulated pump beam 32 with lens 34 and a probe beam 22 on the surface 14 of sample 12, obtaining two or more measurements by analyzing the reflected probe beam using detector 26, which then sends a signal to processor 40 containing an in-phase value and a quadrature value, with the in phase and quadrature values being used to calculate the magnitude and phase of the signal (Col.

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6, lines 28-44), which in turn can be used to derive an abruptness value for the junction (Col. 4, line 25).

Smith fails to disclose the change of the relative position of the pump and probe beams on the sample surface between the measurement capture.

Opsal (Fig. 1) discloses an apparatus for evaluating metalized layers on semiconductors where the sample 12 is placed on a stage 14 that is “capable of precise movements and functions to scan the sample with respect to the laser beams” (Col. 4, lines 20-23).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to place the sample of Smith on a moveable stage as per Opsal, the motivation being that the moveable stage will allow for multiple locations of the sample to be measured with a single setup of the optical device, making measurements of entire semiconductors more efficient and more accurate with only the stage being moved to facilitate the measurements of different portions of the test object.

Regarding claim 5, Smith (Fig. 1) discloses a method of evaluating the abruptness of a junction in a semiconductor sample, the method comprising focusing an intensity modulated pump beam 32 with lens 34 and a probe beam 22 on the surface 14 of sample 12, obtaining two or more measurements by analyzing the reflected probe beam using detector 26, which then sends a signal to processor 40 containing an in-phase value and a quadrature value, with the in phase and quadrature values being used to calculate the magnitude and phase of the signal (Col. 6, lines 28-44), which in turn can be used to derive an abruptness value for the junction (Col. 4, line 25).

Smith fails to disclose the direction of the probe beam to a second measurement spot different from the first spot within the excited region of the sample.

Opsal (Fig. 1) discloses an apparatus for evaluating metalized layers on semiconductors where the sample 12 is placed on a stage 14 that is “capable of precise movements and functions to scan the sample with respect to the laser beams” (Col. 4, lines 20-23). As such, when the sample stage is moved, it directs the probe beam to a second measurement spot, still in the excited region of the sample excited by the probe beam, which is different from the first spot.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to place the sample of Smith on a moveable stage as per Opsal, the motivation being that the moveable stage will allow for multiple locations of the sample to be measured with a single setup of the optical device, making measurements of entire semiconductors more efficient and more accurate with only the stage being moved to facilitate the measurements of different portions of the test object.

As for claims 3 and 6, the pump and probe beams overlap on the sample (for example, Col. 5, line 66 – Col. 6, line 3 of Smith).

As for claim 4, Smith discloses that, “it is also well known to create libraries of signatures associated with various possible geometries. A measured signaled [sic] can then be compared to the library to determine the geometry of the sample” (Col. 7, lines 29-32).

Allowable Subject Matter

Claims 2, 7, 9, 13, and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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The following is a statement of reasons for the indication of allowable subject matter:

As to claims 2, 9, and 21, the prior art of record, taken either alone or in combination, fails to disclose or render obvious the derivation of a slope of a line in the in-phase and quadrature plane fitted to the in-phase and quadrature values that compose taken measurements, and using the derived slope in combination with a previously derived slope associated with a calibration sample having known junction abruptness, in combination with the rest of the limitations of the above claims.

As to claims 7 and 13, the prior art of record, taken either alone or in combination, fails to disclose or render obvious further processing including the analysis of the slope or shape of a line fit to the in-phase and quadrature components derived from measurement points as plotted in in-phase and quadrature space, in combination with the rest of the limitations of the above claims.

Claims 18-19 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter:

As to claim 18, the prior art of record, taken either alone or in combination, fails to disclose or render obvious a method of characterizing a semiconductor sample, where the method comprises obtaining two or more measurements via the analysis of a reflected probe beam off a sample surface, with one measurement following previous measurements after a predetermined time, followed by the fitting of a result curve using a function with two or more variables, and characterizing the incompleteness of an annealing process and/or the presence of

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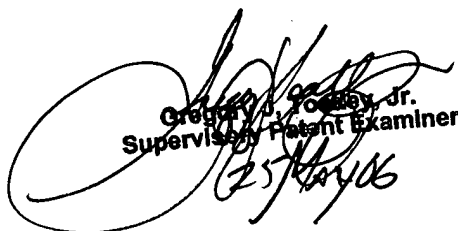
surface states by the evaluation of the curve, in combination with the rest of the limitations of the above claims, and in the best understanding of the examiner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael A. Lyons whose telephone number is 571-272-2420. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley can be reached on 571-272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAL
May 21, 2006


Gregory J. Toatley, Jr.
Supervisory Patent Examiner
25 May 06